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Pathomorphological studies of caprine mastitic udder

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Abstract

An in-depth study was conducted to find the pathomorphological alterations of udder tissue in four numbers of chronic caprine mastitis cases with six blocked teat. Does were screened for mastitis by presence of typical clinical signs of swelling, firmness or palpable nodules and/or partially /completely blocked teat, Somatic cell count (SCC) and Modified Californian Mastitis Test (MCMT). Haemto-biochemical observations showed decreased Hb, TEC and increased TLC along with increase in Total Protein (TP), Globulin, Na⁺ and Cl⁻. Representative tissue samples were collected after thorough curetting and processed for routine histopathology. The microscopic changes of udder parenchyma revealed mostly inflammatory changes with leucocytes infiltrations and replacement of fibrous connective tissue and/or atrophy of glandular tissue. Glandular lumens were filled with RBCS and some areas showed more fibrotic proliferation along with congestion and hemorrhages. This study will be helpful in refreshing the knowledge among the vets in the context of the paucity of literature available on pathology of caprine mastitis around the globe.

Keywords: Caprine, histopathology, mastitis, udder

Introduction

Mastitis, the inflammation of udder parenchyma considered as the most important disease of small ruminants. Reduced milk yield, high mortalities in kids, expenses towards veterinary aids, discarded milk and reduced lifespan in milking goats affect the economic aspect involved in this disease^[1]. Milk yield in dairy goats can be reduced up-to 25% & at times up to 100%. Lack of awareness about the diseases results in chronic infection with blocked teat. Despite all the advancement in the diagnosis and treatment of the disease, mastitis in goats remains as an important cause for loss of health in animal and economical blow to the poor farmers^[2]. Inflammatory reaction in mastitis owing to heavy infiltration of leucocytes results in detrimental effects not only in the intramammary tissues^[3] but also in milk ducts, alveoli etc. causing changes in milk quantity and quality^[4]. Morphological alterations as well as histological changes seen in mammary gland in mastitis attributed mostly to toxins released by invading pathogens as well as increased vascular permeability^[5]. Keeping in view the production loss and most importantly culling of animals as a squeal to mastitis along with mortality, this study is designed to elucidate the gross and microscopic changes of udder tissue in chronic caprine mastitis.

Materials & Methods

A total of four numbers of does with history of chronic mastitis were included in the study. Affected does were screened by the history, presence of clinical signs, SCC and MCMT. Gross lesions relating to pathomorphological alterations of udder were recorded. Representative tissue samples from affected udder tissue were collected for routine histopathology in the Department of Veterinary Pathology.

Results

During the study spanning over a period of 12 months i.e. June 2017 to May 2018, screening of caprine mastitis were conducted among 753 number of goats in two organized and twelve unorganized farms in Odisha. Goats were investigated on the basis of history, clinical signs related to mastitis, SCC and CMT which showed about 173 numbers of mastitic does comprising an overall prevalence of 22.97% among the total goats. Out of 753 goats, only 246 numbers of does were in lactating stage resulting 69.91% mastitis prevalence. Present study

concluded about 1.6% (n=4) of chronic mastitis basing on history of occurrence of the diseases more than 2 months. Milk from affected doe showed SCC > 4 lakhs. MCMT score 3+ i.e. (Distinct slime formation which adheres to the bottom of the paddle) found for that doe with high SCC while other affected does with blocked teat, it was not possible to go for SCC and MCMT as the milk secretion completely stopped due to blockage. History suggestive of more than 2 months of clinical mastitis in the present study with partially or completely blocked teat (n=6) were considered as chronic mastitis. All the affected does were of Ganjam breeds and aged around 2-4 year.

Clinical signs

Clinical signs as observed in the present study include mostly abnormal milk, udder redness, firmness and other systemic signs like fever, pyrexia, pneumonic signs and nasal discharges (Fig.1), agalactia, inappetance / anorexia were the common findings in mastitis affected does. Does affected with chronic mastitis were showing inappetance, irregular fever, swollen joints, reluctance to go for grazing, erratic or swaying back movement and diarrhea.

Haematological examination

The present research study showed a decrease in Hb, Total Erythrocyte Count (TEC) and increase in Total Leucocyte Count (TLC) in goats with chronic mastitis. Mean \pm SE of Hb was found to be 9.40 ± 0.15 . TEC value was hovered around 8.32 ± 0.08 . In chronic mastitis, there was leucopaenia with mean \pm SE of TLC ranged about 5.74 ± 0.09 . Neutrophilia and lymphopaenia observed in goats screened with chronic mastitis.

Serum biochemical examination

The present study showed a decrease in various serum biochemical parameters like Total Protein (TP), Globulin, Na^+ and Cl^- concentrations in chronic mastitis affected does. Mean \pm SE of Na^+ , Cl^- , Total protein (TP) and Globulin in chronic mastitic goats, was found 130.89 ± 0.25 , 92.68 ± 0.13 , 68.47 ± 0.20 and 32.9 ± 0.27 respectively.

Gross findings

Three does affected with chronic mastitis died during the study. Systemic post-mortem examination was conducted to observe various patho-morphological abnormalities in various systemic organs. Gross morphometry of udder include swelling with pendulous shape (Fig.2), palpable nodules (Fig.3), asymmetry of teats (Fig.4), distortion of shape of mammary gland, indurations and atrophy with sclerotic texture were seen in affected does with chronic mastitis. In one case, gangrenous mastitis was evident with blackening of the udder parenchyma. Most of the teats were almost blocked with no secretions while few showed very scanty secretions. Udders were firm and hard. Upon cutting the udder tissue, no milk like whitish exudates was found. Liver shows congestion. There were tracheal exudates with pneumonic changes and consolidation in lungs in one carcass. Gross changes in intestine showed congestion with catarrhal exudates. Gelatinization of cardiac fat with endocardial hemorrhages and chicken fat clots inside the ventricles were constant findings in all the carcasses. Nephritis with rough cortical surfaces was clearly seen. Death of three affected does as observed during the study might be due to pneumonia owing to secondary bacterial infection due to suppression of

immunity in persistent infection.

Histopathology

The microscopic changes of udder tissue revealed typical inflammatory responses along with replacement of fibrous connective tissue as well as atrophy of glandular parenchyma. There was presence of RBCs (Fig.5) along with fibrotic proliferation. Glandular alveoli were infiltrated with inflammatory cells (Fig.6) which attributed to animal's active immune response against infections. Congestion and hemorrhages were more evident in glandular lumen filled with erythrocytes with proliferation of fibrotic cells. There was disruption of alveoli (Fig.7) and exfoliation of alveolar epithelial cells along with necrosis of alveolar wall. Distended along with cystic alveoli (Fig.8) were clearly evident in most of the cases. There was exposure of alveolar basement membrane (Fig.9) resulting due to necrosis of alveolar epithelium evident in most of the chronic mastitis cases through microscopic examination. Fibrotic proliferation both interlobular and interacinar (Fig.10) along with blocked acini (Fig.11) was most frequent observations. Degenerative lesions were clearly evident in the acinar epithelial cells. Mild interstitial fibrosis with greatly reduced acini was resulting in loss of secretory activity and indurations of udder parenchyma in chronic mastitis. Infiltration of substantial mononuclear cells comprising lymphocytes and histiocytes and few polymorphonuclear (PMNs) cells (Fig.12) were clearly seen in most of the cases.



Fig 1: Doe showing systemic clinical signs (nasal discharges) – Fig.11



Fig 2: Pendulous udder – Fig.12

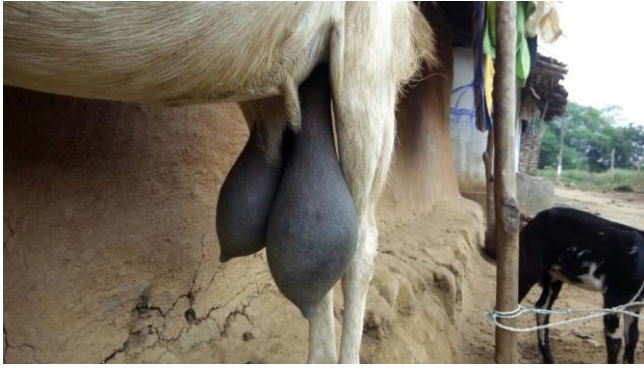


Fig 3: Palpable nodules in udder – Fig.13



Fig 4: Asymmetry of teats – Fig.14

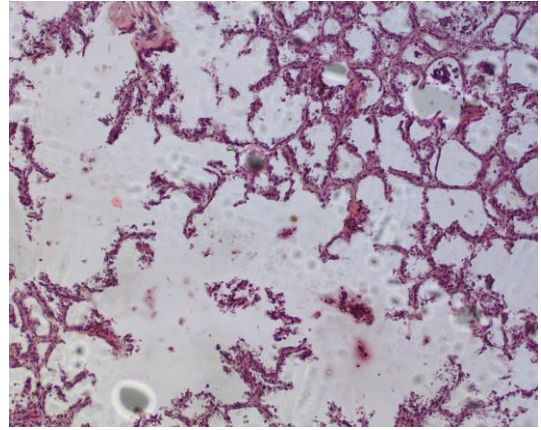


Fig 7: Disruption of alveoli

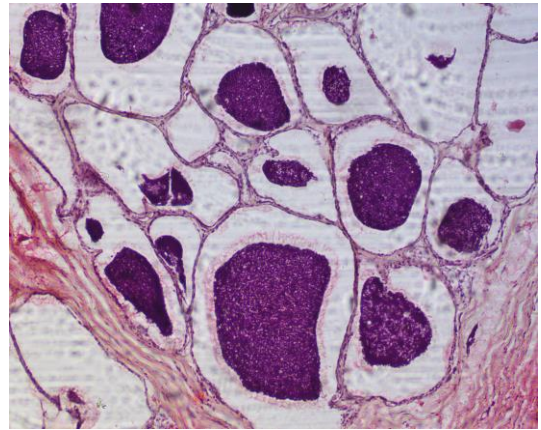


Fig 8: Cystic dilation of alveoli

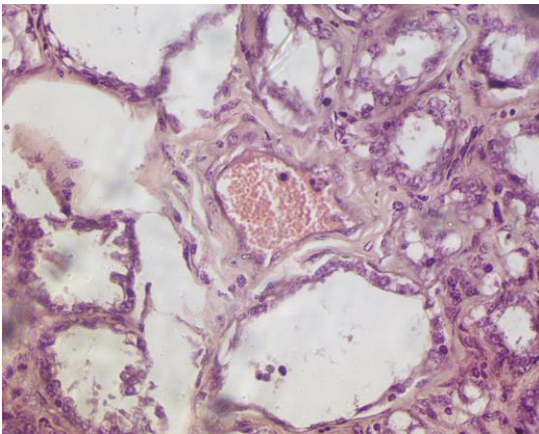


Fig 5: Presence of RBCs

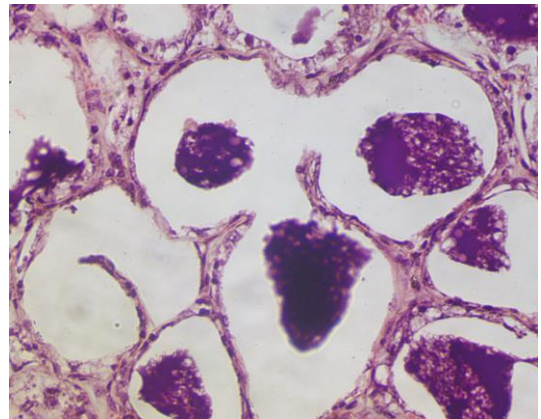


Fig 9: Necrosis of alveolar epithelium exposing the basement membrane

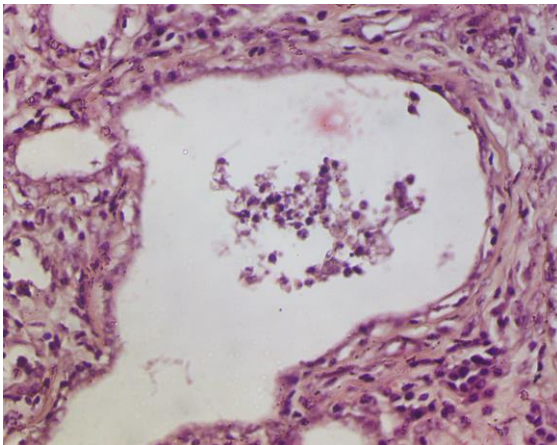


Fig 6: Infiltration of inflammatory cells

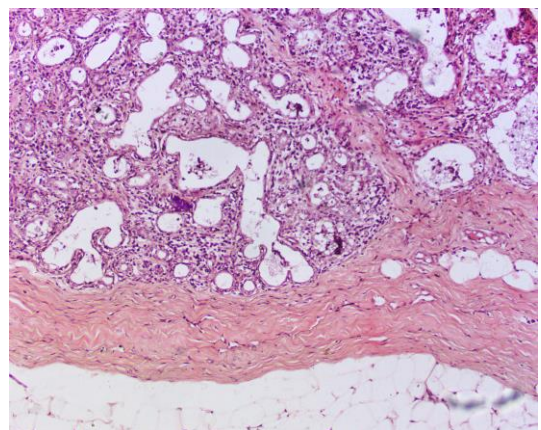


Fig 10: Fibrotic proliferation both interlobular and interacinar

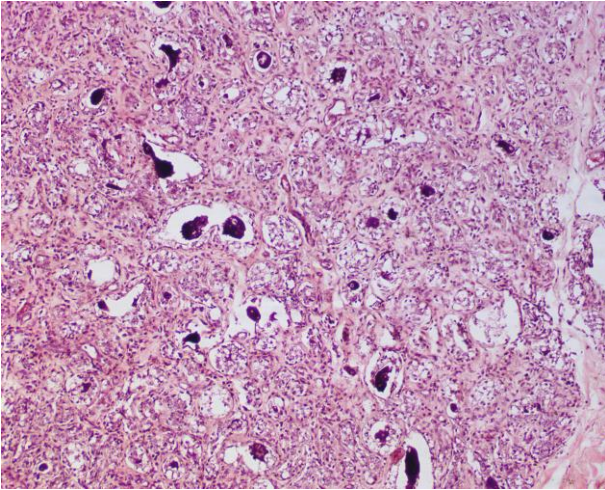


Fig 11: Blocked acini

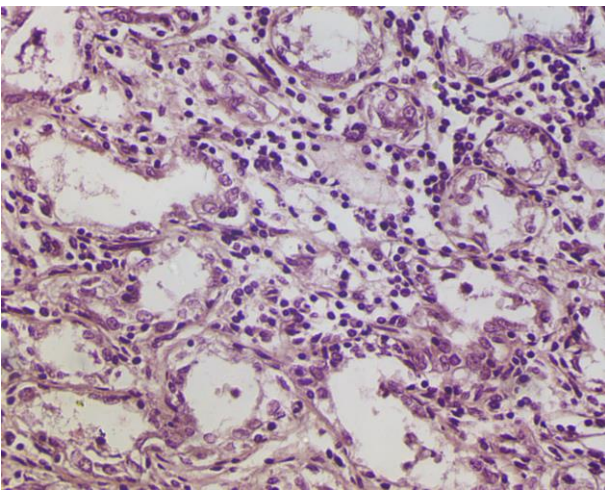


Fig 12: Infiltrations of polymorphonuclear cells

Discussion

Present finding of higher prevalence of mastitis among does was in agreement with findings of other workers [6, 7]. Clinical findings like swelling, indurations, presence of palpable nodules, anorexia etc. as observed are in context with Marogna *et al.* [6] who stated that Streptococous and Staphylococous organisms as common environmental pathogens on a long run cause atrophy, hardening of the udder. All the affected does were of Ganjam breed aged around 2-4 years [8, 9] which are dual purpose breed found in some pockets of Odisha. Teats of such breed are little longer and more prone to lacerations which if unattended in timely may progress to chronic infection. Present study showing a decrease in Hb and TEC might be due to rupture of the vessels owing to toxins released by the microorganisms in chronic infection status maintained in the animal. Increase in TLC show active immune response of the animal to infections thus recruiting more inflammatory cells to blood. These findings were in accorded with previous findings [10, 11]. Serum biochemical parameters like Total Protein (TP), Globulin, Na⁺ and Cl⁻ concentrations in the present study showed a decreasing trend [12, 13] which might be due to increase of vascular permeability and leakage of blood from microvasculature to the glandular acini.

Gross findings

Blocked teat, distortion of udder with asymmetry of teats [14], Palpable nodules and sclerotic or atrophied udder as found in

the present study might be attributed to chronicity of infection resulting more connective tissue proliferation in the tissue parenchyma. Mononuclear cells like macrophages predominantly found in the persistent infection are the source of various growth factors such as fibroblast growth factor which cause firmness of the parenchyma and reduced glandular weight. Discolored udder parenchyma in one case in this study might be due to gangrenous mastitis owing to Clostridial infections resulting blue-black color of udder tissue. Present findings are in agreement with other workers [15, 16]. Sclerotic changes found in this study could be due to lack of attention by owners for early infection and not timely presentations for treatment which may prolong leading to chronic mastitis [14, 17].

Histopathology

The histological findings were in accordance with the study conducted by the earlier workers [18, 19, 20]. Reduced glandular weight leading to atrophy of udder parenchyma as seen in chronic mastitis may be attributed to partially or complete displacement of acinar alveoli by fibrotic proliferation. Somewhat pendulous udder or distorting udder as seen in one or two chronic mastitis cases in the present study might be due to damage of the suspensory ligament by the persistent inflammatory reactions resulting in loss of elasticity of tissue. Infiltration of inflammatory cell in the tissue in the study is suggestive of active host immune response against microbial infection. Presence of mononuclear cells might be attributed to chronicity of infection.

Conclusion

Chronic mastitis in does is mainly due to lack of attention of animal owners to the early infections which might prolong to form sclerotic, atrophic or fibrotic changes in udder parenchyma. Reduced glandular weight and fibrotic proliferation as well as infiltration of mononuclear cells are predominant microscopic feature. Prompt attention to minor teat injury and awareness among the farmer may reduce the risk of chronic mastitis in does.

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Conflict of interest

There is no conflict of interest among the authors.

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